

An analytical study of Respiratory Tract Infections in Diabetes Mellitus patients

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Abstract

Introduction: Alternations in host defence mechanism in entire body as well as locally in lung, is the most important pathological factor in DM with lower respiratory tract infections (LRTI) patients. Studies and observations showing a high risk of infections in diabetics exist as this topic is still being debated upon. Impaired lung function and glucose intolerance, insulin resistance, type 2 diabetes and obesity have been proposed to be linked to each other [11-14]. The current study was undertaken to determine the correlation between LRTI in patients with DM. **Methods:** Total of 100 cases of DM with lower respiratory tract infections were analysed in a period of 1 year to study the association between DM and lower respiratory tract infections. All 100 patients selected randomly from all ages and either sex admitted in local randomly selected Secondary and tertiary Care Hospitals (TB and chest ward) of our Block. The results obtained were analyzed in detail using statistical methods. **Results:** The present study was carried out on 100 patients having DM with LRTI. The commonest age group affected was of 40-60 years (57%). Males were affected more than females with male: female ratio was 2.12. 38% patients were from urban area while 62% were from rural areas. 48% patients were from lower socioeconomic status, 34% from middle socioeconomic status and 18% from upper socioeconomic status. Cough and fever were most common symptoms. Besides that anorexia, weight loss, breathlessness, chest pain and haemoptysis were observed. Among all organisms causing LRTI, Mycobacterium tuberculosis was the most common organism isolated. Other organisms like Streptococcus pneumoniae, Klebsiella pneumoniae, Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, and Influenza A (H1N1) were also isolated. No organism was isolated in 35% patients. **Conclusions:** LRTI is common clinical illness among diabetic patients. DM patients with age more than 50 years, duration more than 4 years and uncontrolled DM status have higher chances of developing LRTI and other DM related complication. Mycobacterium tuberculosis is the most common isolated pathogen among DM with LRTI patients. Patients of DM with pulmonary TB have higher sputum positive grading. Radiologically, moderate to far advanced lesions with bilateral involvement were more common with predominant exudative or mixed variety. Study revealed that lack of education, poor life style, poor nutrition and absence of follow-up visits led to development of serious respiratory infections among diabetics. So there is a great need of health counselling regarding strict diabetic control and follow-up visits to improve their quality of life.

Keywords: LRTI, Mycobacterium, DM, Streptococcus.

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Introduction

Respiratory tract infections are perhaps the most common human illness [1,4]. At present an epidemic of Diabetes mellitus (DM) is ongoing both in developed and developing countries [2]. Alternations in host defence mechanism in entire body as well as locally in lung, is the most important pathological factor in DM with lower respiratory tract infections (LRTI) patients. Impaired function of respiratory epithelium and impaired ciliary motility are also contributing factors. Diabetes mellitus (DM) and obesity have always been considered to be associated with carrying a high risk for community-acquired infections. Despite the large number of studies, the pathogenesis of respiratory tract infections (RTIs) in both conditions is still elusive. It is only recent that we find laboratory findings consistent with the hypothesis that subjects with obesity and DM may have variations in immune system that may predispose them to infections. Various studies have been carried out to find out the relationship between DM and the risk of acquiring upper respiratory tract infections (URTI).

The increased number of infections in both conditions may be associated with a decrease in T-cell-mediated immunity as well as an impairment in function of neutrophils.² DM patients are mostly affected by streptococcus pneumoniae, influenza virus, legionella, mycobacterium tuberculosis, staphylococcus aureus, mucor and gram-negative bacterial infections. Therefore, DM is considered to confer an increased risk of lower respiratory tract infections (LRTIs)[2-7]. DM with LRTI patients usually present with serious clinical features, longer duration of illness, more frequent complications and increased mortality [7,8]. Mortality due to LRTI in a diabetic patient is approximately four fold higher than the general population. Tuberculosis (TB) occurs with an increased frequency in diabetics with greater mortality. Increased reactivation of old TB lesions has also been reported in diabetics [9,10]. At the same time, TB appears to aggravate hyperglycaemia and patients requiring higher insulin doses than before. Incidence of diabetes as such appears to be higher among TB patients as compared to the general population. Studies and observations showing a high risk of infections in diabetics exist as this topic is still being debated upon. Impaired lung function and glucose intolerance, insulin resistance, type 2 diabetes and obesity have been proposed to be linked to each other [11-14]. The current study was undertaken to determine the correlation between LRTI in patients with DM.

Methodology

Total of 100 cases of DM with lower respiratory tract infections were analysed in a period of 1 year from Jan 2018 to Jan 2019 to study the

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association between DM and lower respiratory tract infections. All 100 patients selected randomly from all ages and either sex admitted in local randomly selected Secondary and tertiary Care Hospitals (TB and chest ward) of our Block. Patients with DM, either known case or first time diagnosed, presented with LRTI determined by clinical and radiological findings, were included in this cross sectional study. Patients having upper respiratory tract infection or having extra pulmonary manifestation without pulmonary infection were excluded from the study. All Patients data had details of standard clinical examinations, routine biochemical and haematological investigations. The study duration was 12 months. Information on each patient selected were carefully obtained by using a pre- designed structured proforma. This Proforma included data on present age, age of onset, area of residence, personal and family history, seasonal variation, religion of the patient, mile stone development, socio-economic status of the parents, history of relapse etc. Informed consent was obtained from all the patients before being enrolled into the study. All patients underwent detail medical history with detail physical examination.

Routine laboratory investigations like haemoglobin, total WBC count, differential WBC count, random blood sugar, fasting blood sugar, post-prandial blood sugar, renal function test, liver function test, urine routine and microscopic examination, erythrocyte sedimentation rate, X-ray chest, two sputum smear examination for AFB with Ziehl-Neelsen stain and culture-sensitivity were carried out in all patients. Imaging study like ultrasonography and computed tomography scan were done whenever indicated. Diagnosis was made on the basis of clinical, radiological and laboratory findings. A written and informed consent was obtained from all the patients. For those below the age of 18 years, the consent of the guardian was taken.

Statistical Analysis

The data obtained were analyzed in detail using the statistical software SPSS 20 for Windows. Data are reported as mean \pm SD or proportions and 95% confidence intervals. Statistical analysis was performed by tests of significance and p-value < 0.05 was considered statistically significant.

Results

Table 1- Demographic profile of 100 patients of DM with LRTI in present study(n=100)

Age group	\leq 20 (03%) 21-40 (24%) 41-60 (57%) >60 (16%)
Gender (M : F)	68:32 (2.12)
Socio economic status	Lower - 48% Middle - 34% Upper - 18%
Residence	Urban - 38% Rural - 62%
Addiction	Smoking - 31% Alcohol - 39% Tobacco chewing - 68% Non addicted - 22%

Table 2: Clinical profile of 50 patients of DM with LRTI in present study(n=100)

Symptomatology	Cough – 95%, Fever -89%, Breathlessness - 25%, Anorexia - 48% Chest pain - 29%, weight loss -17% hemoptysis - 23%
Duration of DM	First time detected - 19% <1 yr - 11% 1 to 5 yr - 44% >5 yr - 26%
Treatment history	First time detected - 23% OHA - 57% Insulin - 13% OHA + Insulin - 07%
Status of DM	First time detected - 19% Controlled - 11% Uncontrolled - 70%
Associated complication	Retinopathy - 13% Vasculopathy - 04% Nephropathy - 06% Neuropathy - 11%
Isolated organism	<i>Mycobacterium tuberculosis</i> - 21% <i>Streptococcus pneumoniae</i> - 18% <i>Klebsiella pneumoniae</i> - 08% <i>Staphylococcus aureus</i> - 04% <i>Pseudomonas aeruginosa</i> - 06% <i>Escherichia coli</i> - 02% <i>Influenza A (H1N1)</i> - 06% No pathogen isolated - 35%

Table 3: Radiological profile of 50 patients of DM with LRTI in present study

Location	Bilateral - 58%	
	Unilateral - 42%	Upper lobe - 12% Middle lobe - 04% Lower lobe - 17%
Type of lesion	Exudative - 83% Nodular - 16% Cavitory lesion - 42%	
Extent of lesion	Minimal - 17% Moderately advanced - 50% Far advanced - 33%	

The present study was carried out on 100 patients having DM with LRTI. The commonest age group affected was of 40-60 years (57%). Males were affected more than females with male: female ratio was 2.12. 38 % patients were from urban area while 62% were from rural

areas. 48% patients were from lower socioeconomic status, 34% from middle socioeconomic status and 18% from upper socioeconomic status. Cough and fever were most common symptoms. Besides that anorexia, weight loss, breathlessness, chestpain and haemoptysis were

observed. Among all organisms causing LRTI, *Mycobacterium tuberculosis* was the most common organism isolated. Other organisms like *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Influenza A (H1N1)* were also isolated. No organism was isolated in 35% patients.

Discussion

LRTI in DM was most common in age group of 40-60 years with mean age of 46.37 years. Males were affected more than females. Cough with or without expectoration and fever was the prominent clinical features. 27% of the patients had family history of DM and 10% of the patients had family history of TB, which suggest that DM has higher degree of genetic predisposition and DM patients have higher chances of developing TB because of immune compromised state. The mean duration of DM at the time of diagnosis of the pulmonary infection was 4.86 years. 70% of the patients did not have DM under control at the time of detection of LRTI, which suggests that a strict diabetic control is important to prevent such infections. *Mycobacterium tuberculosis* was the most isolated organism in diabetic patients. The reasons for inability to detect any organism in sputum in 35% of patients are dry cough due to early stage of consolidation, prior treatment with antibiotics and improper sputum collection. Radiographs suggested that isolated lower lobe involvement, either unilateral or bilateral was more common. Exudative lesion and cavitary lesions were more common than nodular lesions. Most of patients had moderate to far advanced lesion with bilateral involvement.

The reasons for inability to detect any organism in sputum in 35% of patients are dry cough due to early stage of consolidation, prior treatment with antibiotics and improper sputum collection. Radiographs suggested that isolated lower lobe involvement, either unilateral or bilateral was more common. Exudative lesion and cavitary lesions were more common than nodular lesions. Most of patients had moderate to far advanced lesion with bilateral involvement.

Conclusion

LRTI is common clinical illness among diabetic patients. DM patients with age more than 50 years, duration more than 4 years and uncontrolled DM status have higher chances of developing LRTI and other DM related complication. *Mycobacterium tuberculosis* is the most common isolated pathogen among DM with LRTI patients. Patients of DM with pulmonary TB have higher sputum positive grading. Radiologically, moderate to far advanced lesions with bilateral involvement were more common with predominant exudative or mixed variety. Lower lobe involvement is more common among DM patients. *Influenza A (H1N1)* pneumonia has higher mortality in diabetics than non-diabetics. Study revealed that lack of education, poor life style, poor nutrition and absence of follow-up visits led to development of serious respiratory infections among diabetics. So there is a great need of health counselling regarding strict diabetic control and follow-up visits to improve their quality of life.

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